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ABSTRACT

Research is being conducted at the Florida State University (FSU) School of Information Studies to determine the importance of interaction (teacher-student, student-teacher, student-student) to the success of World Wide Web-based learning graduate degree programs. Success will be measured in terms of retention, student satisfaction, and learning outcomes at three intervals: (1) completion of an individual course; (2) completion of the degree program; and (3) one year following the completion of the degree program. Understanding the importance of interaction is crucial to understanding why students do or do not successfully persist in Web-based learning. This understanding can be used to guide decision-making in a variety of areas related to the delivery of individual distance courses and entire degree programs. This study consists of two parts: a detailed examination of the graduate Web-based distributed learning degree program of the FSU School of Information Studies; and a comparative survey of comparable Information Studies Web-based distributed learning degree programs in North America. A pilot study was conducted in Fall 2000, and data collection of Part One was begun, with projected data collection completion by August 2001. (Contains 21 references.) (Author/MES)

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Interaction and student retention, success and satisfaction in web-based learning

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Abstract:

Research is being conducted at the Florida State University School of Information Studies to determine the importance of interaction (teacher-student, student-teacher, student-student) to the success of web-based learning graduate degree programs. Success will be measured in terms of retention, student satisfaction, and learning outcomes at three intervals: (a) completion of an individual course; (b) completion of the degree program; (c) one year following the completion of the degree program. Understanding the importance of interaction is crucial to understanding why students do or do not successfully persist in web-based learning. This understanding can be used to guide decision-making in a variety of areas related to the delivery of individual distance courses and entire degree programs.

This study consists of two parts: I. A detailed examination of the graduate web-based distributed learning degree program of the FSU School of Information Studies; and II. A comparative survey of comparable Information Studies web-based distributed learning degree programs in North America. A pilot study was conducted in Fall 2000 and data collection for Part 1 is currently underway, with projected data collection completion by August 1, 2001.

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Statement of the Problem

Much has changed since postmen served as the vehicle by which distance education reached the student in the 19th century, including the fact that it is as likely that a woman will deliver your mail as a man today. In the 19th century, commercial correspondence colleges provided distance education via the mail to students across the country. The 20th century continued the trend of distance education with the inventions of radio, television and other media. Students today experience education at a distance through significantly different formats of delivery. They no longer wait for the postman to bring assignments and correspondence from an instructor, or gather around a television in a central location, but may simply turn on a computer, check their e-mail, an electronic bulletin board, or spend a few minutes on I-chat. And, today, distance crosses geographic boundaries, with students from around the world registered together in courses.

The utilization of new technology in providing education has raised concerns regarding interaction of learners and instructors. Must students and teachers be face-to-face to interact? What does interaction involve? How does online interaction compare with face-to-face interaction? Does more frequent interaction contribute to success? What roles do intensity and topicality of interaction play?

The Research Question

A study underway at Florida State University seeks to explore these concerns, and particularly, to answer the question:

- **Is high interaction positively correlated with student and program success in graduate web-based distributed learning degree programs?**

Establishing whether or not high interaction as measured in terms of frequency, intensity, and topicality has a positive correlation with success in web-based learning is a crucial first step to moving beyond the "no significant difference" debate that has characterized the research on the effects of media on learning since the 19th century. debate (Russell 1999, and see **Review of Pertinent Literature**, below) Web-based learning is enjoying a popularity unprecedented by earlier distance learning delivery modalities. As reported in the March 30, 2001 *Chronicle of Higher Education*, the enrollments in Internet courses at the University of North Texas alone increased by nearly 300% between Fall 1999 and Spring 2001 (Young 2001), and other institutions are reporting similar enrollment growth. Clearly research needs to move beyond comparative media studies to an examination of the key elements that may contribute to success or failure. Interaction is frequently cited as one of these key elements.

Significance of the Research

This study seeks to determine the importance of interaction to the success of web-based learning graduate degree programs. Success will be measured in terms of retention, student satisfaction, and learning outcomes at three intervals: (a) completion of an individual course; (b) completion of the degree program; (c) one year following the completion of the degree program. Understanding the importance of interaction is crucial to understanding why students do or do not successfully persist in web-based learning. This understanding can be used to guide decision-making in a variety of areas related to the delivery of individual distance courses and entire degree programs.

Graduate professional education in Information Studies was chosen for this study in order to ensure specific applicability to the information technology area where the projected demand for education will far outstrip our universities' traditional classroom resources. Thus, this study contributes to the solution of a national concern some consider to be of crisis proportions. According to a 1999 U.S. Department of Congress report, growth in the IT sector will increasingly lead to differentiated educational demands.

First, there has been sustained rapid growth in the demand for highly-skilled IT workers—demand that has accelerated in recent years. This demand is the product of the Information Age—virtually every segment

of the American economy has em-braced IT for the productivity improvements it brings to existing business functions, as well as for the new capabilities, products and services IT enables. The ubiquity of IT can be seen almost everywhere: in the shift of business's equipment investment into information technologies, in the unprecedented emergence of the web as a venue for commerce and communication, and in the proliferation of computers in busi-nesses and homes to name a few. As a result, demand for highly-skilled IT workers leads all other occupations and is expected to continue in the years ahead. Second, the variety and complexity of software and hardware products and their applications, together with the unique business requirements of each industry, have created "spot" demand for workers with unique combinations of IT skills, experience and industry knowledge—expressed often by employers as needing "the right person, with the right skill, at the right time." The combination of time-sensitive competitive pressures and limited-time need for employees with unique combinations of technical skills, business skills, and hands-on experience has led many employers to pursue "buy" decisions in this labor market, rather than "make" decisions (to hire, then train for the task). Thus while there is a need to address the growing demand for highly-skilled IT workers, there is the additional challenge of meeting the unique demands of this niche labor market. (Meares and Sargeant 1999)

Schools of Information Studies have already stepped forward to contribute to meeting the demand for IT workers and managers skilled in the intermediary role making vital connections between people and information at both the graduate professional master's degree and undergraduate levels. Staggering enrollment growth, however, will seriously impact these efforts unless new and innovative strategies, such as the adoption of web-based learning, can be developed and deployed with confidence. The Florida State University School of Information Studies experienced 500% enrollment growth from 1994 to 2000. We have successfully managed this increase through adoption of web-based delivery modalities, with approximately half of our current students at all levels receiving their education at a distance.

REVIEW OF THE PERTINENT LITERATURE

History of Distance Learning

An early proponent of distance learning was the Open University (OU) in Britain, offering a model for universities to observe and pattern their own programs. Over two million students have taken courses since 1971 through OU's virtual education model that uses various multimedia methods. The university offers personal tutoring and in some cases a weekend or weeklong class at a central location. For those who question the teaching methods, university officials note that the institution tends to rank high in national assessment. (Blumenstyk 1999) While there are proponents of distance learning, some educators are not so sure that technology makes a significant difference. The book, *The No Significant Difference Phenomenon,* is comprised of numerous articles that suggest there is little difference in methods of learning, but the studies do provide substantial evidence that technology does not denigrate instruction. This opens doors to use technologies to increase efficiency, bridge distances or circumvent other obstacles, yet assure the outcomes will be comparable to conventional classrooms or those employing the use of expensive, sophisticated technology. (Russell 1999)

Interaction in Distance Learning

The utilization of new technology in providing education has raised concerns regarding interaction of learners and instructors. Must students and teachers be face-to-face to interact? What does interaction involve?

There are generally three types of interaction that are considered aspects of a learning environment. They are:

- *Learner-content interaction* – the interaction of the student with the subject matter and the constructing of knowledge through new understanding.

- *Learner-instructor interaction* – the instruction, assisting, stimulation and support provided by the instructor to the learner. The learner can test the viability of new understanding with the instructor who serves as a representation of expert knowledge.
- *Learner-learner interaction* – the interaction between one learner and other learners whether alone or in a group. It may or may not be in the presence of an instructor. (Soo and Bonk 1998)

Synchronous and Asynchronous Interaction

With today's evolving technology, distance learning is vastly different from the days of gathering students around a television in a central location. It generally includes synchronous and/or asynchronous communication. Synchronous communication occurs when the student and instructor are present at the same time during instruction, although they may be in different locations. Asynchronous communication occurs when the student and instructor do not participate in direct person-to-person interaction at the same time or place. Other aspects of learning at a distance include activities or instruction where the learner is at a different location from the originator and a combination of media may be employed--such as computers, software, e-mail, telephone, fax, Internet, television, or videoconferencing--to facilitate learning. (Phipps & Merisotis 1999 #40})

Pedagogy and Interaction in Distance Learning

While the new approaches to teaching and learning are studied, the traditional methods of teaching are also being analyzed. Do traditional classrooms prepare students to be lifelong learners, adaptable to the demands of society, the economy or business requirements? How do the traditional methods and philosophies differ with education in an information-age environment?

Whereas teachers once lectured, they are becoming facilitators who guide, coach, and motivate. Collaborative learning is replacing an atmosphere of working alone and presenting one's "own" work. Group work is encouraged as it more closely emulates the way people work most often in the real world. Teamwork is encouraged as it provides different perspectives on issues, skills and ways to solve problems. Learning is becoming student-centered as opposed to the professor, library and other sources of information being at the center with students clustered around them for access or interaction. This allows the student to become self-directing in planning the acquisition of education. Therefore, key changes for education in the information age stress collaborative learning, interaction, and problem solving or reasoning rather than memorization. (Oblinger 1996)

Today's students expect and demand instruction with high levels of interaction between students and instructor and immediate access to information from around the globe. The demand for interactivity has placed a new focus on instructional design as well as the technologies that provide two-way delivery. Current technologies encourage students to be self-reflective as the flow of instruction may no longer be sequential and non-interactive. ({Parker 1999 #60})

Previous multimedia systems, known as second generation systems that included printed matter, television, audio or video tapes, limited personal interaction to one-to-one exchanges and were best suited for mass usership. However, use of network technologies, known as third generation distance education systems, have provided models that add to the social component of the learning process while constructing new knowledge. The systems create learning communities where individuals can overcome isolation and benefit from group interaction. This approach also encourages learners to take an active part in setting objectives, defining the contents and capitalizing on life experiences, requiring that the learning process hinge on strong interaction between all participants. {Trenton 2000 #70}

Current technology changes the social dynamics of education by placing everyone (learners and teachers) on equal footing. All learners have equal opportunity to post and read messages, thereby allowing for

ideas from everyone rather than just the instructor. ({Kearsley 1997 #80} Carl Rogers, psychologist and educator, felt "teaching" was a vastly over-rated function and that educators were not there necessarily to impart knowledge but to facilitate and guide the learning process. A proponent of student-centered learning, Rogers believed students must learn how to learn, how to adapt to change and learn the process of seeking knowledge. {Rogers 1969 #110}

Faculty whose experience is limited to lecturing in a classroom may find themselves in an electronic learning environment using technologies they did not grow up with but their students did and are very comfortable with using the technology. They will be faced with learning new ways of interacting, facilitating student-centered learning and becoming a resource for information. ({McClure [undated] #90} Rather than continuing to lecture online, instructors will be more successful by adopting the role of facilitator or moderator who encourages participation and keeps discussions focused. {Kearsley 1997 #80}

Malcolm Knowles developed the andragogical model (helping adults learn) for education long before current technology existed but the concepts are a natural fit for student-centered learning in distance learning. He felt learning by adult students must be interactive and self-directing with the teacher being the facilitator. He suggested adult students wish to be self-directing, have valuable life experiences to draw upon, are ready and motivated to learn, but are especially drawn to task or problem-centered learning rather than subject-centered. (Knowles 1984)

Interactive or Collaborative Learning

Interactive learning, or collaborative learning is a natural outcome of distance education with technology providing many avenues for interactions between students, instructors and information. Students are encouraged to be involved in learning activities and participate in group projects since modern business is generally built on teamwork. Collaborative learning in online classes means students work together without knowing each other, benefiting them is a variety of ways:

- Everyone on the team is equal
- Barriers related to gender, ethnicity, age or shyness are eliminated
- Face-to-face time may become more efficient
- Online lecture notes and readings allow students time to reflect
- Utilization of time is more flexible at the convenience of the student
- Instructors can stay in touch with students when off campus ({Oblinger & Maruyama 1996 #50}

While the benefits of collaborative learning seem positive and easily accomplished with distance learning, every student may not be an expert user of the technology that implements the online class. Therefore, it is necessary for students to become acquainted with the technology before beginning the class. Also, some students may be slow in opening up to the group and participating, choosing to be a lurker in the background instead, while other students may exhibit a greater degree of boldness online. Establishing group sizes of no more than four may enhance interactivity, encourage more interaction, and facilitate efficient teamwork. ({Carnevale 2000 #120}

As each student is a unique individual with individual needs, there are many ways of implementing the methods and modes of distance education. The innovative instructor will be the one who utilizes diverse methods to facilitate learning. The value of distance learning and how it should be done has spawned considerable literature but there are still misconceptions regarding online education. A fear of losing interaction and the dynamics of face-to-face communication is felt keenly by many who value being able to see faces light up with "ah-ha" expressions or puzzled looks that indicate lack of understanding.

Some students begin with the misconception that online classes are easy, or at least easier than conventional classes, but find they require much more work than expected. Instructors report being concerned about conducting tests with the potential for cheating but others find ways to assign projects and individualize assignments. Another misconception is that only those who are very computer literate can best accomplish online education. While some knowledge and experience are necessary, a student or instructor need not be an expert. The technology is merely the vehicle by which distance learning is delivered. {Kearsley 1997 #80}{Bannon 1995 #130}

Technology, or the computer, is the medium that helps the student communicate and collaborate with one or many persons, synchronously or asynchronously. It is a support and resource for acquiring an education outside of the traditional classroom. (Bannon 1995) While research shows a slight learning advantage for newer media, in the end it is the content carried by the vehicle that results in learning. The curricula, interaction, and collaboration assist students in constructing knowledge. (Clark 1983)

Isolation is overcome and interactivity is enhanced through computer mediated communication (CMC) as students who live in diverse locations may exchange information, work on projects, and communicate asynchronously with few limitations of time and space. (Henri 1995) Since the virtual classroom is not bound by time or place, there is a potential for greater interaction as projects and student discussion may continue at any time. (Barreau 2000)

Interactivity is often cited as one of the most important elements of successful online education, but flexibility is also an aspect students frequently indicate as a reason for participating in learning by distance. Flexibility in interacting becomes crucial for many students due to varied schedules, allowing them to contact instructors and other students through e-mail anytime or from any location. The availability of bulletin boards, chat-rooms, and e-mail provide continuous interaction but in an asynchronous mode. (Morris 1999)

Adult students find a greater degree of flexibility in asynchronous learning as it more easily accommodates work schedules. Designated times for I-chat may conflict with the work schedule, therefore preventing some students from attending the session, or perhaps the course. (Carr 2000) Asynchronous learning also allows students time to reflect and think before responding to ideas, questions or comments made by others. This reflection time enables students who feel uncomfortable with speaking out in the traditional class an opportunity to participate. (Alexander 1999)

A study of five distance classes offered at Drexel showed that 36 percent of the interactions took place between 8 p.m. and midnight and 22 percent took place between 4 p.m. and 8 p.m. Feedback from the students indicated 85 percent felt they had more access to the instructor than in a conventional course, 80 percent would take another course asynchronously, and 95 percent felt that seeing the ideas and assignments of others was useful. ({Oblinger & Maruyama 1996 #50}) Distance education instructors asked to rank types of interaction felt asynchronous learning activities are most important but also indicated synchronous teacher-learner interaction is important to the learning process. (Soo and Bonk 1998)

Students and instructors acknowledge that asynchronous communication stimulates interactivity by providing an opportunity for round-the-clock contact time for reading and responding to e-mail, while synchronous learning requires real-time communication. Real-time also demands being in a given place at a given time. If student-centered learning is to take place the instructor must become a facilitator rather than the traditional lecturer and encourage the group dynamic of brainstorming. Synchronous communication provides opportunities for sharing ideas or experiences, making the process more like natural conversation that stimulates thought and ideas.

Participating in "group discussion" contributes to community building by bringing people together, not in physical locations, but based on ideas, concepts or theories. While some view synchronous communication as a potential for one-way activity, that would not be an ideal mode. The instructor

becomes the facilitator who encourages all students to contribute to the group dialog. Done in a collegial and nurturing way, relationships can be developed that will last long past the class meetings and even lurkers may find the environment safe enough to speak from time to time. Even though asynchronous communication allows time for reflection it may generate a more formal response, whereas synchronous communication generates a more natural informality and less structured dialog. (Shotsberger 2000)

METHOD AND ANALYTICAL TECHNIQUES

Research on web-based distributed learning is in its infancy, and as is appropriate, even the most self-evident results are subject to questioning and controversy. Most of the research to date is limited in its generalizability because it is either too system specific, too course specific, or the population size is too small for statistical significance.

In addition to its role in meeting the national shortage of information technology workers and managers, the field of Information Studies was selected for this study because the ratio of institutions offering the master's degree at a distance to the total number of graduate degree-granting institutions is relatively high when compared to other fields. Over 35% of all ALA accredited schools in North America offer a master's degree with no residency requirement. An additional 11% require limited residency (3-15 credit hours). This is a field that has considerable experience with distance delivery. Several institutions have offered full professional master's degree programs at a distance for more than ten years. Therefore, the artifacts of recent change (such as change in pedagogical style) that have been criticized in the literature on media effects are less likely to be present in this field than in many others (Clark 1983).

The degree program at the FSU School of Information Studies was selected for Part I of this study because its web-based distributed learning program is relatively mature (4 years at the initiation of the study), offers a sufficient number and range of courses (20 courses in two majors), and enrolls a sufficiently large number of students (approximately 400 students participate in web-based courses during an academic year).

In Part I of this study, web-based course offerings at the FSU School of Information Studies are examined using content analysis to determine type and degree of interaction (See **Table 1** for a summary of the parts of the study). While all of the courses are delivered using a common interface, a wide variety of tools, technologies, and media are incorporated in configurations that vary from course to course depending on pedagogical needs. Some courses require frequent interaction, while others require only occasional interaction. Some courses emphasize synchronous interaction, while others emphasize asynchronous interaction. Table 2 outlines the content analysis scheme.

Part I of the study examines the synchronous and asynchronous interaction logs for twenty courses. Each course is placed on an interaction scale (vertical axis) from low to high interaction, based on the number and frequency of observable interactions (See **Figure 1**). Each course is also placed on a synchronicity scale (horizontal axis) from asynchronous to synchronous, with courses that employ an even mix of synchronous and asynchronous interactions located at the mid point. Based on this plot, cluster analysis is used to establish course interaction types. In-depth interviews with faculty teaching the courses and focus-group interviews with students enrolled in the courses will be conducted to further probe these designations, and in-depth interviews and observations will be conducted at two other universities to ensure that the interaction types are transferable to other contexts.

Three measures of success may be established for each course interaction type: retention, student satisfaction (survey to be developed), and learning outcomes (grades [at intervals 1 & 2] and employment in the field or acceptance to an advanced graduate degree program [at interval 3]). Data are collected at three intervals: (1) completion of the course; (2) completion of the degree program; (3) one year following completion of the degree program. A student/graduate perception measure is used to compare success according to course interaction type; univariable parametric technique may allow either t-test, ANOVA or regression techniques to be used.

In Part II, all other North American institutions offering web-based graduate degree programs in Information Studies will be asked to participate in a comparative survey. Each program will be provided with instructions for typing each web-based course offering for the past two years using the course types developed in Part I. For each course, these institutions will be asked to provide information regarding retention rate, and any data they may have collected regarding student satisfaction and learning outcomes. All institutions will be offered the opportunity to administer the student satisfaction survey developed in Part I at the three designated intervals. The data collected in this study will help to validate the data collected in Part I by extending:

1. The number and types of development and delivery modalities employed (addresses system specificity)
2. The number and range of content of courses examined (addresses course specificity)
3. The size, institutional diversity, and geographical diversity of the population (addresses size of population)

A pilot study of Part I of the research has been conducted using five FSU summer courses. As a result of the pilot project, a content analysis scheme has been developed for use in the research study to be conducted on Phase I and II of the study. This pilot study has provided initial data from which to develop the satisfaction survey instrument for the interview portions of the research. The five courses have been plotted and tentative indicators of course types have been developed. In-depth interviews were held with faculty teaching two of the courses, and focus interviews will be held with students enrolled in two of the courses by mid-April. The data collected from these interviews will be used to verify and extend the tentative indicators.

IMPORTANCE OF FINDINGS

This study will provide empirical findings that will assist in the design and development of web-based distributed learning courses and degree programs.

Higher education administrators will be able to use these results to support informed decision-making regarding:

- Evaluation of proposals for web-based delivery of degree programs, including understanding interaction indicators for success
- The resources required to support well-designed distance learning programs, particularly as relates to interaction and student success and satisfaction
- The selection of course development products to assist faculty in designing courses that have appropriate frequency, intensity and topicality of interaction
- The selection of course delivery products that provide appropriate and well-designed interaction tools
- The selection of infrastructural technologies, especially as relates to interaction support.

Faculty will be able to use these results to support informed decision-making regarding:

- Preparation of proposals for web-based delivery of degree programs, including understanding interaction indicators for success
- The resources required to support well-designed distance learning programs, particularly as relates to interaction and student success and satisfaction

- The design of courses that have appropriate frequency, intensity and topicality of interaction
- The selection of course delivery products that provide appropriate and well-designed interaction tools
- The selection of infrastructural technologies, especially as relates to interaction support.

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TABLE 1: STUDY DESIGN

	Course Completion	Degree Completion	1-yr post Degree Completion
Part 1	• Analyze Logs -content analysis -Cluster analysis • Faculty Interviews • Student Focus Group Interviews • Student Satisfaction Survey	• Retention Data • Student Satisfaction Survey	• Learning Outcomes • Student Satisfaction Survey
*Part 2	• **Typing of courses** • **Faculty Interviews** • **Student Focus Groups** • **Student Satisfaction Survey**	• **Retention Data** • **Student Satisfaction Survey**	• **Learning Outcomes** • **Student Satisfaction Survey**
	• **Correlation of data as related to retention rate, student satisfaction, and learning outcomes**		
Funds are requested for expenses pertaining to Part 2 of the study			

Interactivity Research: Phases and tasks for Parts 1 and 2

TABLE 2: CODES FOR CONTENT ANALYSIS PROJECT

Format

A = Asynchronous

S = Synchronous

Actors

In = instructor

St = student

Ta = teaching assistant

He = help-person (help-"name")

Gu = Guest participant

Mt = mentor assigned to the course

Interaction

B = asking a question, directive to start an interaction, or a redirection of interaction

R = responding to a previous statement, verbal or non-verbal

X = two types of interactions in a single statement; a transition.

Activity

P = activity process (anything to do with the mechanics of the course, administration, class management, etc.)

C = activity content (anything to do with the content of the course, i.e., asking about how to do an assignment, quiz, etc.)

Topic

T = topic (the subject of the discussion, i.e., what is being discussed in class that day or in a FO posting) as indicated in the course Calendar.

Misc.

Nr = any non-relevant statements and actions; not related to content.

Nv = non-verbal

Order of the coding

Format-Actors-Interaction-Activity/Topic- (n)

FIGURE 1: INTERACTIVITY SCALE

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